

DOCUMENT RESUME

ED 117 573

CE 006 290

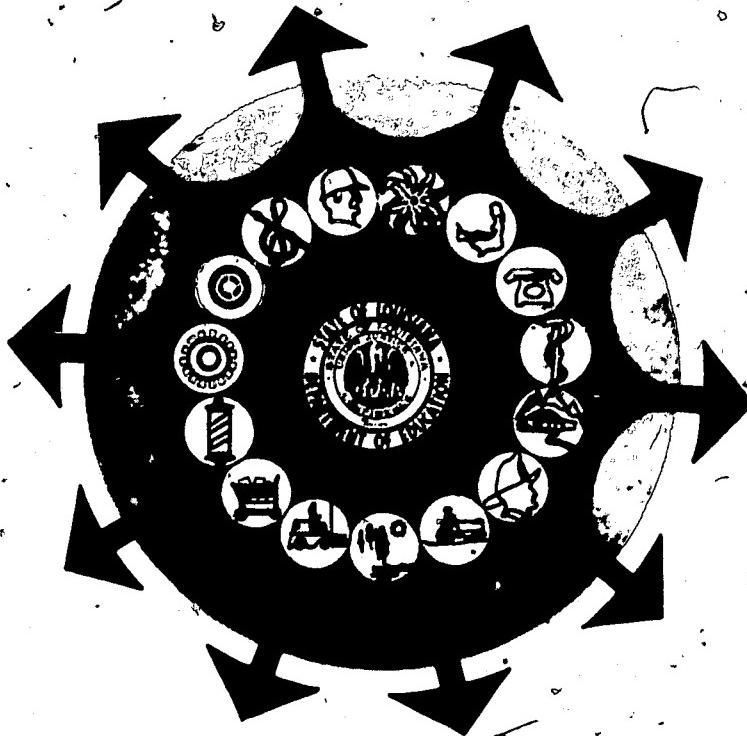
AUTHOR Nuschler, Alexandra; And Others
TITLE Geometry: Mathematics Curriculum Guide (Career Oriented).
INSTITUTION Louisiana State Dept. of Education, Baton Rouge.
REPORT NO Bull-1280; VT-102-469
PUB DATE May 74
NOTE 55p.; For related documents, see CE 006 282-291
EDRS PRICE MF-\$0.83 HC-\$3.50, Plus Postage
DESCRIPTORS Behavioral Objectives; *Career Education; *Curriculum Guides; *Geometry; Learning Activities; Mathematical Applications; Mathematics Curriculum; *Secondary Education
IDENTIFIERS Louisiana

ABSTRACT

The curriculum guide correlates concepts in geometry with career-oriented concepts and activities. The curriculum outline format gives the concepts to be taught, matched with related career-oriented performance objectives, concepts, and suggested instructional activities in facing page layouts. The suggested curriculum outline is compatible with all books on the approved textbook list for Louisiana. The outline is divided into the major sections of elements of geometry, introduction to proof, lines and planes, congruence, polygons and polygonal regions, circles, similarity, trigonometry, plane coordinate geometry, and solid figures. (NJ)

* Documents acquired by ERIC include many informal unpublished *
* materials not available from other sources. ERIC makes every effort *
* to obtain the best copy available. Nevertheless, items of marginal *
* reproducibility are often encountered and this affects the quality *
* of the microfiche and hardcopy reproductions ERIC makes available *
* via the ERIC Document Reproduction Service (EDRS). EDRS is not *
* responsible for the quality of the original document. Reproductions *
* supplied by EDRS are the best that can be made from the original. *

ED 117573



MATHEMATICS CURRICULUM GUIDE CAREER ORIENTED GEOMETRY

BULLETIN NO. 1280

Louisiana State Department of Education
Louis J. Michot, Superintendent
1974

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY.

MATHEMATICS CURRICULUM GUIDE
(CAREER ORIENTED)
GEOMETRY

LOUISIANA STATE DEPARTMENT OF EDUCATION

Louis J. Michot
State Superintendent

May 1974

WT. 102469.

ACKNOWLEDGEMENTS

Appreciation is expressed to the original writing team which worked so diligently in developing the materials and ideas included in the guideline.

Mrs. Alexandra Nuschler, Chairwoman

Chalmette High School
Chalmette, Louisiana

Mrs. Eleanor Hollingsworth

Logtown Junior High
Monroe, Louisiana

Mrs. Jocelyn Landry

Coteau-Bayou Blue Elementary
Houma, Louisiana

Mr. John H. Smith

Rayville High School
Rayville, Louisiana

Mrs. Margaret Thames

Mangham Junior High
Mangham, Louisiana

For their constructive suggestions and additions in this revised edition, we give special thanks and acknowledgement to this year's team.

Dr. Merlin M. Ohmer, Chairman

Nicholls State University
Thibodaux, Louisiana

Mr. Dale Fredrick

Lafayette Parish School Board
Lafayette, Louisiana

Mr. Dale Hester

Nicholls State University
Thibodaux, Louisiana

Mr. Joseph Jones

Mansfield High School
Mansfield, Louisiana

Mrs. Alexandra Nuschler

Chalmette High School
Chalmette, Louisiana

Mrs. Marguerite Sanders

Sabine Parish School Board
Many, Louisiana

Finally, we express our gratitude to Superintendent Louis J. Michot, who has been the spearhead in promoting the concept of career education for all, and to the Louisiana Legislature which recognized the need for such a program and saw that funds were made available to carry on this worthwhile endeavor.

PREFACE

The first working draft of the Mathematics Curriculum Guide Secondary Level was distributed for field testing for the 1973-74 academic year. Feed-back indicated that the materials were appropriate for the purposes as stated in the original preface.

The materials presented herein have been changed from the original only in that the mathematical language has been made as uniform as possible for clarity and to conform to the texts adopted by the State of Louisiana. Additional career learning activities have been introduced.

The format has been revised so that it should be easier to correlate the curriculum outlines and performance objectives with the related career oriented concepts and learning activities.

The reader who is seeing the materials for the first time can be assured that the career approach of these guidelines in no way weakens the present program. As in all good educational procedures, materials are included so that all levels may be served. In addition to the ambitious minimum recommendations the guidelines contain ample materials for those students who need to be challenged.

Mathematics is embedded in all of the disciplines and makes a solid base for experiences in career education. This is borne out by the numerous references and career activities from the spectrum of life.

The student is led in a systematic development that is designed to provide for continuous progress. Dignity of the person was always foremost in devising and revising the guidelines. The goals were set to give maximum development of the individual through all types of educational experiences.

Finally, our schools will always have a basic curriculum. The methods of instruction will be constantly changing, and the counselors will continue to lend their influence in guiding the pupil. The career education goals which are interwoven with the traditional will help make more productive citizens of Louisiana's most important assets, its children.

TABLE OF CONTENTS

	Page
Acknowledgements	ii
Preface	iii
Elements of Geometry	1
Foundations of Geometry	1
Symbols and Sets	3
Geometric Concepts	5
Basic Postulates	5
Lines	5
Angles	5
Definitions and Construction	9
Introduction to Proof	13
Conditional Sentence	13
Nature of Proof	13
Proofs of Simple Theorems	13
Lines and Planes	15
Lines	15
Planes	17
Congruence	19
Definition of Congruence	19
Basic Congruence Postulates of Theorems	19
Constructions and Proofs	19

Polygons and Polygonal Regions	23
Definitions	23
Area	23
Polygonal Angles and Sides	25
Theorems	25
Circles	27
Lines, Arcs, Segments, and Points to a Circle	27
Angles Associated with a Circle	27
Circular Region	29
Theorems Related to Circles	29
Additional Geometric Concepts	31
Similarity	33
Ratio and Proportion	33
Similarity Between Two Polygons	33
Similarity in Triangles	35
Trigonometry	37
Trigonometric Ratios	37
The Table of Trigonometric Functions	37
Angle of Elevation and Angle of Depression	37
Plane Coordinate Geometry	39
Cartesian Coordinate System in a Plane	39
Lines	39
Analytical Proof	41
Solid Figures	43
Terminology	43

Area

43

Volume

45

GEOMETRY

GEOMETRY

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
<p>I. Elements of Geometry</p> <p>A. Foundations of Geometry</p> <ol style="list-style-type: none">1. Undefined terms2. Defined terms3. Assumptions4. Theorems5. Intuitive approach	<p>I. Elements of Geometry</p> <p>A. To demonstrate a basic understanding of the foundations of geometry, the student should be able to:</p> <ol style="list-style-type: none">1. Explain why undefined terms are needed and identify some basic undefined terms2. Identify some basic defined terms and use them correctly in statements3. Explain why it is necessary to assume some statements to be true.4. Distinguish between conjecture and theorem.5. Explain intuitively why several given theorems are true.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES

RELATED CAREER ORIENTED LEARNING ACTIVITIES.

I. Career Concept

Careers are affected by the ability of individuals to relate to each other.

Performance Objectives

CURRICULUM OUTLINE

PERFORMANCE
OBJECTIVES

B. Symbols and sets

1. Identification

2. Specification

3. Set operations and relationships

4. Venn diagrams

B. To demonstrate an understanding of symbols and sets in geometry, the student should be able to:

1. Identify:
 - a. Geometric symbols
 - b. A set as finite or infinite
 - c. The empty set \emptyset
 - d. The universal set
2. Specify a set by:
 - a. Rule (set builder notation)
 - b. Roster (list)
3. Define:
 - a. The union of two sets
 - b. The intersection of two sets
 - c. The complement of a set
 - d. One-to-one correspondence
 - e. Equality of two sets
 - f. A is a subset of B
 - g. A is a proper subset of B
4. Illustrate existing set operations and relationships by the use of Venn diagrams.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES

B. The draftsman must be familiar with geometric symbols and use them in producing drawings as prescribed by specifications.

RELATED CAREER ORIENTED LEARNING ACTIVITIES

B. Examine a house plan and from this list the geometric symbols to identify terms such as electrical outlets, door openings, windows, bathroom fixtures, etc.

CURRICULUM OUTLINE

PERFORMANCE
OBJECTIVES

C. Geometric concepts

1. Point
2. Line
3. Plane
4. Line segment
5. Ray
6. Angle

D. Basic postulates

E. Lines

1. Horizontal
2. Vertical
3. Intersection
4. Parallel

C. To demonstrate an understanding of basic geometric concepts, the student should be able to identify and illustrate:

1. Point
2. Line
3. Plane
4. Line segment
5. Ray
6. Angle

D. To demonstrate an understanding of postulates, the student should be able to state some basic postulates. (e.g., for any two points there is exactly one line that contains them.)

E. To demonstrate an understanding of lines, the student should be able to define, identify, or illustrate:

1. A horizontal line
2. A vertical line
3. The possible intersection of two coplanar lines.
4. Parallel lines.

**RELATED CAREER ORIENTED
CONCEPTS AND OBJECTIVES**

**RELATED CAREER ORIENTED
LEARNING ACTIVITIES**

- E. The surveyor checks the alignment of a structure by using a plumb line.

- E. To construct a makeshift plumb line, tie a metal nut (or other small, heavy object) to one end of a piece of string. Attach the other end of the string to the top of a stake. To assure that the stake is driven vertically into the ground, keep the plumb line parallel to the stake while driving it.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
5. Skew	5. Skew lines
6. Perpendicular	6. Perpendicular lines.
7. Transversal	7. A transversal
F. Angles	F. To demonstrate an understanding of angles, the student should be able to:
1. Definitions	1. Define, identify, and sketch an acute angle, a right angle, an obtuse angle, a straight angle, a reflex angle, and a dihedral angle.
2. Measurement	2. Determine the measure of an angle by using a protractor.
3. Classification	3. Classify angles from their measures {e.g., $m(A) = 60^\circ$, $m(B) = 90^\circ$, $m(C) = 120^\circ$, $m(D) = 180^\circ$, $m(E) = 260^\circ$ }
4. Angle pairs	4. Define, identify, and sketch adjacent angles, vertical angles, complementary angles, supplementary angles, congruent angles, and a linear pair of angles.

**RELATED CAREER ORIENTED
CONCEPTS AND OBJECTIVES**

**RELATED CAREER ORIENTED
LEARNING ACTIVITIES**

F. A navigator of an airplane uses angles in constructing a scale drawing to determine the location of a plane.

F. Make a scale drawing showing the point of departure and the position of an airplane at the end of a three-hour flight on a course of 60° at ground speed of 250 m. p. h.

CURRICULUM OUTLINE**PERFORMANCE OBJECTIVES****G. Definitions and construction****1. Definitions****2. Angles****3. Triangles****4. Regular polygons****5. Bisector of a line segment****6. Bisector of an angle****7. Perpendicular lines**

G. To demonstrate an understanding of fundamental constructions by using a compass and straightedge, the student should be able to:

1. Define triangle, polygon, regular polygon, segment bisector, and angle bisector.
2. Copy a given angle.
3. Construct a triangle given:
 - a. Two angles and the included side.
 - b. Three sides
 - c. Two sides and the included angle
4. Construct regular polygons of three sides, four sides, and six sides.
5. Construct the bisector of a line segment.
6. Construct an angle bisector.
7. Construct a perpendicular to a given line:
 - a. At a point on the given line
 - b. From a point not on the line

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES.

G. An artist usually draws freehand using only a pencil and paper, whereas the draftsman uses construction instruments such as dividers, T-squares, French curves, etc.

A craftsman uses basic constructions to lay out geometric shapes.

RELATED CAREER ORIENTED LEARNING ACTIVITIES

G. Draw a regular hexagon freehand. Measure each angle carefully. Are they of equal measure? Construct a regular hexagon. Measure these angles. They should measure 120° .

A circular metal rod, 3" in diameter, is to be machined so that a vertical cross section will be a square of maximum size. Construct such a square on one of the ends (vertical cross section of the circular rod.)

CURRICULUM OUTLINE

PERFORMANCE
OBJECTIVES

8. Parallel lines

8. Construct a line
parallel to a
given line.

**RELATED CAREER ORIENTED
CONCEPTS AND OBJECTIVES**

**RELATED CAREER ORIENTED
LEARNING ACTIVITIES**

CURRICULUM OUTLINE

PERFORMANCE
OBJECTIVES

II. Introduction to Proof

II. Introduction to Proof

A. Conditional sentence

A. To demonstrate an understanding of a conditional sentence, the student should be able to identify and illustrate a conditional sentence, its hypothesis, and its conclusion, and its contrapositive, converse, and inverse.

B. Nature of proof

B. To demonstrate an understanding of the nature of proof the student should be able to prove a theorem (stated in the form of a conditional sentence) by assuming that the hypothesis is true and then proving that the conclusion must also be true.

C. Proofs of simple theorems

C. To demonstrate a further understanding of proof, the student should be able to prove (directly or indirectly) other simple theorems and write his proofs in standard two column form.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES

II. Career Concept

Careers require a certain degree of reasoning.

Performance Objectives

RELATED CAREER ORIENTED LEARNING ACTIVITIES

CURRICULUM OUTLINE**PERFORMANCE OBJECTIVES****III. Lines and Planes****A. Lines****1. Definitions****2. Postulates**

- a. Parallel postulate
- b. Euclid's fifth postulate

3. Conditions for parallelism**4. Theorems**

- a. Intersecting lines
- b. Parallel lines

III. Lines and Planes**A.**

To demonstrate an understanding of lines the student should be able to:

1. Define and identify:
 - a. Coplanar lines
 - b. Corresponding angles.
 - c. Alternate interior angles
 - d. Alternate exterior angles

2.

- State:
 - a. The parallel postulate
 - b. The fifth postulate

3. State conditions which guarantee that two lines are parallel (equivalent forms of the parallel postulate)

4. State and prove some basic theorems involving:
 - a. Intersecting lines
 - b. Parallel lines

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES

III. Career Concept

Every career requires some special preparation.

Performance Objectives

- A. The ground crew for a football field uses parallel and perpendicular lines in laying out the field for a game.

RELATED CAREER ORIENTED LEARNING ACTIVITIES

- A. Construct a diagram of a football field given the scale of the drawing and the dimensions of the field.

CURRICULUM OUTLINE**B. Planes****1. Definitions****2. Proofs of simple theorems****PERFORMANCE OBJECTIVES**

B. To demonstrate an understanding of planes, the student should be able to:

1. Define or illustrate:
 - a. Line parallel to a plane
 - b. Parallel planes
 - c. Line intersecting a plane
 - d. Intersecting planes
 - e. Line perpendicular to a plane
 - f. Perpendicular planes
 - g. Projection of a line on a plane

2. Prove simple theorems concerning lines and planes.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES

B. A woodcraft designer uses planes in many of his designs.

RELATED CAREER ORIENTED LEARNING ACTIVITIES

B. List examples of planes in the classroom.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
IV. Congruence	IV. Congruence
A. Definition of congruence	A. To demonstrate an understanding of congruence the student should be able to define the relation "is congruent" on the set of:
1. Segments	1. All segments
2. Angles	2. All angles
3. Triangles	3. All triangles
4. Quadrilaterals	4. All quadrilaterals
B. Basic congruence postulates or theorems	B. To demonstrate further understanding of congruence the student should be able to state the basic congruence postulates (SAS Postulate, SSS Postulate, and ASA Postulate) and prove basic congruence theorems. (e.g., SAA Theorem)
C. Constructions and proofs	C. To demonstrate a further understanding of congruence, the student should be able to:
1. Congruent triangles	1. Construct a triangle congruent to a given one and prove the construction is valid.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES

IV. Career Concept

Some occupations require an understanding of congruence.

Performance Objectives

A. Surveyors can use congruence in determining distance.

B. A metalsmith often finds it necessary to give balance to many of his designs.

RELATED CAREER ORIENTED LEARNING ACTIVITIES

A. Use congruence of triangles to explain how the distance across a lake can be determined.

B. Design a square emblem with a triangle in one corner. Give balance to the design by constructing a congruent triangle in the opposite corner.

CURRICULUM OUTLINE

PERFORMANCE
OBJECTIVES

2. Isosceles triangle

2. Define an isosceles triangle; define the base angles of an isosceles triangle; construct an isosceles triangle and prove its base angles are congruent.

3. Equilateral triangle

3. Define an equilateral triangle; construct an equilateral triangle and prove its angles are congruent to each other.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
V. Polygons and Polygonal Regions	V. Polygons and Polygonal Regions
<p>A. Definitions</p> <ol style="list-style-type: none"> 1. Polygon 2. Convex polygon 3. Regular polygon 4. Interior 5. Polygonal region 	<p>A. To demonstrate an understanding of polygons, the student should be able to define, identify, or illustrate:</p> <ol style="list-style-type: none"> 1. A polygon 2. A convex polygon 3. A regular polygon 4. The interior of a polygon 5. A polygonal region
<p>B. Area</p> <ol style="list-style-type: none"> 1. Triangular region 2. Quadrilateral region 	<p>B. To demonstrate further understanding of polygonal regions, the student should be able to:</p> <ol style="list-style-type: none"> 1. Compute the area of a triangular region. 2. Compute the area of selected quadrilateral regions (e.g., square, rhombus, parallelogram, etc.)

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
<p>V. <u>Career Concept</u></p> <p>Many careers require competence in the use of polygons.</p> <p><u>Performance Objectives</u></p> <p>A. An architect uses a basic knowledge of polygons in creating new designs for building and other construction.</p> <p>B. Farmers often use their knowledge of quadrilaterals in selecting sites for their gardens.</p>	<p>A. Examine a bridge, or a picture of a bridge and notice how many different polygonal patterns occur in its design.</p> <p>B. A farmer wants to enclose a small rectangular plot of land for a vegetable garden. Since he has only 30 feet of wire fencing, he plans to fence three sides of a rectangle, and let his garage wall act as the fourth side of the enclosure. A friend advises him to enclose a square plot for maximum area, but the farmer maintains that a rectangular plot, one of whose sides measures $7 \frac{1}{2}$ feet, will have greater area. Who is correct?</p>

V. Career Concept

Many careers require competence in the use of polygons.

Performance Objectives

- A. An architect uses a basic knowledge of polygons in creating new designs for building and other construction.

- B. Farmers often use their knowledge of quadrilaterals in selecting sites for their gardens.

- A. Examine a bridge, or a picture of a bridge and notice how many different polygonal patterns occur in its design.

- B. A farmer wants to enclose a small rectangular plot of land for a vegetable garden. Since he has only 30 feet of wire fencing, he plans to fence three sides of a rectangle, and let his garage wall act as the fourth side of the enclosure. A friend advises him to enclose a square plot for maximum area, but the farmer maintains that a rectangular plot, one of whose sides measures $7 \frac{1}{2}$ feet, will have greater area. Who is correct?

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
<p>C. Polygonal angles and sides</p> <ol style="list-style-type: none"> 1. Sum of angle measures 2. Number of sides 	<p>C. To demonstrate a further understanding of polygons, the student should be able to:</p> <ol style="list-style-type: none"> 1. Determine the sum of the measures of the angles of a regular polygon of a given number of sides. 2. Determine the number of sides of a regular polygon of given angle sum.
<p>D. Theorems</p> <ol style="list-style-type: none"> 1. Pythagorean 2. Interior angles of a triangle 3. Exterior angles of a triangle 	<p>D. To demonstrate a further understanding of polygons, the student should be able to:</p> <ol style="list-style-type: none"> 1. State, illustrate, and prove the pythagorean theorem. 2. Define interior angle of a triangle and prove that the sum of the measures of the interior angles of a triangle is 180°. 3. Define exterior angle of a triangle and prove that the measure of an exterior angle of a triangle is equal to the sum of the measures of the two remote interior angles of the triangle.

**RELATED CAREER ORIENTED
CONCEPTS AND OBJECTIVES**

**RELATED CAREER ORIENTED
LEARNING ACTIVITIES**

CURRICULUM OUTLINE**PERFORMANCE OBJECTIVES****VI. Circles****VI. Circles**

A. Lines, arcs, segments, and points of a circle

A. To demonstrate an understanding of circles, the student should be able to construct, illustrate, or define:

1. Circle, center, and radius
2. Arc, semicircle, minor arc, and major arc
3. Chord
4. Diameter
5. Secant
6. Tangent and point of tangency

B. Angles associated with a circle

B. To demonstrate an understanding of angles associated with a circle, the student should be able to construct and define:

1. Central
2. Inscribed
3. Inscribed in a semicircle

1. A central angle
2. An inscribed angle
3. An angle inscribed in a semicircle

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES

VI. Career Concept

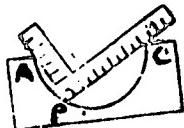
Careers have different levels of competence and responsibility.

Performance Objectives

- A. A pattern maker makes a wood or metal pattern in the shape of the casting desired.

RELATED CAREER ORIENTED LEARNING ACTIVITIES

- A. Whenever a mechanic or a pattern maker wishes to test the accuracy of a semicircular groove or a mold, he places a tri-square in the groove as shown here. If the vertex of the right angle and the sides touch every point (A, P, C) as the tri-square moves around, he can be sure that the groove or mold is a true semicircle. What theorem of geometry is he making use of?



- B. The machinist is a skilled worker who uses machine tools to make metal parts.

- B. Machinists and tool makers often have to make cylindrical block of metal. If a machinist wishes to test the accuracy of his work, he can again use the tri-square as illustrated. If the cross-section of the cylindrical block is a true circle, the edges of the tri-square will touch the surface of the cylinder at equal distances from the heel of the square, that is, the vertex of the right angle. What theorem of geometry is he making use of?

CURRICULUM OUTLINE

PERFORMANCE
OBJECTIVES

C. Circular region

1. Interior

2. Segment

3. Sector

D. Theorems related to circles

C. To demonstrate an understanding of a circular region, the student should be able to define and identify:

1. The interior of a circle

2. Segments of a circle

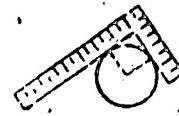
3. Sector of a circle

D. To demonstrate further understanding of circles, the student should be able to state and prove some basic theorems concerning circles.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES

- C. Paving contractors and cement finishers need to be able to compute the area of a circular sector.
- D. Navigators and aviators use theorems related to circles.

RELATED CAREER ORIENTED LEARNING ACTIVITIES



- C. Compute the area of a sector of a circle whose central angle is 30° if the length of the radius is 25 cm. Give your answer correct to the nearest tenth.
- D. Every sphere has an unlimited number of great circles. Each point on a great circle is the same distance from the center of the circle. Hence, the sphere and its great circles have the same center and radius.

The shortest distance between two points on a sphere is the length of the minor arc of a great circle containing both points. When flying from Miami to London the shortest route follows the arc of the great circle passing through Miami and London. Trace the route on a globe.

CURRICULUM OUTLINE

PERFORMANCE
OBJECTIVES

E. Additional geometric concepts

E. To extend his concepts and skills, the student should be able to define and illustrate:

1. Equal circles and congruent circles
2. Externally tangent circles
3. Internally tangent circles
4. Concentric circles

**RELATED CAREER ORIENTED
CONCEPTS AND OBJECTIVES**

**RELATED CAREER ORIENTED
LEARNING ACTIVITIES**

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
VII. Similarity	VII. Similarity
A. Ratio and proportion	A. To demonstrate an understanding of ratio and proportion, the student should be able to:
1. Definitions	1. Define: a. Ratio b. Proportion c. Means d. Extremes
2. Problems	2. Solve problems involving proportions.
3. Proofs	3. Prove selected theorems concerning proportion. (e.g., the means extremes theorem)
B. Similarity between two polygons	B. To demonstrate an understanding of similarity, the student should be able to:
1. Definition	1. Define the relation "is similar to" on the set of polygons.
2. Theorems	2. Illustrate and prove basic similarity theorems.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES	RELATED CAREER ORIENTED LEARNING ACTIVITIES
<p>VII. Career Concept</p> <p>Careers require competence in computation.</p> <p>Performance Objectives</p> <p>A. A professional typist uses proportion to determine the time necessary to type a manuscript.</p> <p>B. A surveyor is an important person in many types of construction. He measures lines and angles, and uses these measurements to determine distances which he cannot measure directly. He uses a great deal of geometry and trigonometry.</p>	<p>A. Donna, a professional typist, can type 8 pages of manuscript in 52 minutes. She agreed to type an article of 20 pages. How long will it take her to type the article?</p> <p>B. A and B are two points on opposite sides of a pond. Show how to find the distance between them by letting C be a point on the same side of the pond as B, and then constructing $\triangle A' B' C'$ so that it is similar to $\triangle ABC$.</p>

CURRICULUM OUTLINE**PERFORMANCE OBJECTIVES****C. Similarity in triangles**

1. Altitude to the hypotenuse in a right triangle
2. Special right triangles
3. Other triangles

C. To demonstrate an understanding of similarity, the student should be able to:

1. Name and apply properties of the altitude drawn to the hypotenuse of a right triangle.
2. Prove the 30-60-90 relationship and the 45-45-90 relationship, then solve problems related to these special right triangles.
3. Prove that corresponding sides of similar triangles are proportional.

**RELATED CAREER ORIENTED
CONCEPTS AND OBJECTIVES**

**RELATED CAREER ORIENTED
LEARNING ACTIVITIES**

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
VIII. Trigonometry	VIII. Trigonometry
A. Trigonometric ratios	A1. To demonstrate an understanding of elementary trigonometry, the student should be able to define the six trigonometric ratios in terms of the measures of the sides of a right triangle.
B. The table of trigonometric functions	B. To demonstrate an understanding of the table of trigonometric functions, the student should be able to: <ol style="list-style-type: none"> 1. Determine the sine, cosine, and tangent of a given angle. 2. Determine the angle whose tangent sine, or cosine is given.
C. Angle of elevation and angle of depression	C. To demonstrate an understanding of angle of elevation and an angle of depression, the student should be able to: <ol style="list-style-type: none"> 1. Illustrate an angle of elevation and an angle of depression. 2. Solve exercises involving angles of elevation and angles of depression.

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES

RELATED CAREER ORIENTED LEARNING ACTIVITIES

VIII. Career Concept

Performance Objectives

B. The table of trigonometric functions is used in solving many problems.

B. The measurements of the angles read by a surveyor are applied to the solution of problems. Frequently, the trigonometric functions of these angles are not listed in the tables but require interpolation.

1. Determine the $\tan 34^\circ 31'$.
2. Determine the angle whose sine is .4216.

C. An air traffic controller is in vocal contact with aircraft pilots. He is responsible for specifying the altitude at which each plane will fly.

C. A helicopter takes off and climbs at an angle of 65° until it reaches an altitude of 350 meters. Determine the horizontal distance from the take-off point and the distance actually traveled by the helicopter.

CURRICULUM OUTLINE	PERFORMANCE OBJECTIVES
<p>IX. Plane Coordinate Geometry</p> <p>A. Cartesian coordinate system in a plane</p> <p>B. Lines</p> <ul style="list-style-type: none"> 1. Distance between two points 2. Slope <ul style="list-style-type: none"> a. Computation b. Estimation 3. Equation of a line <ul style="list-style-type: none"> a. Slope-intercept form b. Two point form 	<p>IX. Plane Coordinate Geometry</p> <p>A. To demonstrate an understanding of a Cartesian coordinate system, the student should be able to sketch a mathematical model of a Cartesian coordinate plane, identify axes, identify quadrants, identify the coordinates of a point, and plot a given point.</p> <p>B. To demonstrate an understanding of plane coordinate geometry, the student should be able to:</p> <ul style="list-style-type: none"> 1. Determine the distance between two points in a coordinate plane. 2. Determine the slope of a line from two given points on the line. Estimate the slope of a line from a given sketch. 3. Determine the equation of a line from: <ul style="list-style-type: none"> a. Its slope and y-intercept b. Two distinct points on the line

**RELATED CAREER ORIENTED
CONCEPTS AND OBJECTIVES**

**RELATED CAREER ORIENTED
LEARNING ACTIVITIES**

IX. Career Concept

None necessary

CURRICULUM OUTLINE**PERFORMANCE OBJECTIVES**

c. Point-slope form

4. Point of intersection

5. Equation of perpendicular line

6. Equation of parallel line

C. Analytical proof

c. A point on the line, and the slope of the line

4. Estimate the coordinates of the point of intersection of two given lines by sketching their graphs in the same plane.

5. Determine the equation of a line perpendicular to a given line.

6. Determine the equation of a line parallel to a given line.

C. To demonstrate a further understanding of coordinate geometry, the student should be able to make a simple geometric proof by means of coordinates.

**RELATED CAREER ORIENTED
CONCEPTS AND OBJECTIVES**

**RELATED CAREER ORIENTED
LEARNING ACTIVITIES**

CURRICULUM OUTLINE**PERFORMANCE OBJECTIVES****X. Solid Figures****X. Solid Figures****A. Terminology**

1. Polyhedron
2. Cylinder
3. Prism
4. Cone
5. Pyramid
6. Sphere

B. Area

A. To demonstrate an understanding of solid figures, the student should be able to identify and illustrate:

1. Polyhedron
2. Cylinder
3. Prism
4. Cone
5. Pyramid
6. Sphere

B. To demonstrate a further understanding of solids, the student should be able to compute the lateral area and the total area of:

1. A cylinder
2. A cone
3. A pyramid

RELATED CAREER ORIENTED CONCEPTS AND OBJECTIVES

X. Career Concept

Careers require different levels of computation.

Performance Objectives

- A. A woodcraft designer requires a basic understanding of solid figures in his work.

- B. A cabinet maker must be able to compute the surface area of a rectangular solid.

RELATED CAREER ORIENTED LEARNING ACTIVITIES

- A. Collect information from the local hobby shops showing the different shapes of wooden objects. Identify each figure as a rectangular solid, cube, pyramid, cylinder, sphere, or cone. Collect pictures from magazines, catalogs, and newspaper advertisements to identify the many different polyhedrons.

- B. John and his father planned to buy material to build a trophy case. The case was to be 12 feet long, 4 feet high, and 1 foot wide. The front, top, and two ends were to be glass. Compute the number of square feet of glass needed. Compute the number of square feet of plywood needed for the back and bottom. (Do not consider shelving.)

CURRICULUM OUTLINE

PERFORMANCE
OBJECTIVES

C. Volume

C. To demonstrate a further understanding of solids, the student should be able to compute the volume of:

1. A tetrahedron
2. A cylinder
3. A prism
4. A cone
5. A pyramid
6. A sphere

**RELATED CAREER ORIENTED
CONCEPTS AND OBJECTIVES**

C. The oil refinery plant manager must calculate volume.

**RELATED CAREER ORIENTED
LEARNING ACTIVITIES**

C. Each cylindrical oil tank at a storage plant has a radius of 45 feet and a height of 110 feet. What is the total capacity of 35 tanks? (There are 7.5 gallons in 1 cubic foot.)